

REPORT ON

**REVIEW OF TARIFF STRUCTURE OF
GUJARAT ELECTRICITY BOARD**

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Review of Current Electricity Tariff Structure of Gujarat Electricity Board

1 Objective of the review

- 1 1 Gujarat Electricity Board is recognized as one of the more efficient and professionally managed Electricity Boards in the country which has consistently been achieving higher than average technical and financial performance. Lately however there has been a noticeable decline in this regard which can be mainly attributed to the somewhat distorted power supply tariff structure of GEB-whereby the Board is required to make electricity available to certain category of consumers at prices much below their cost of production. The objective of the review is to identify such sectors and draw up a strategy which would help in improving the financial condition of the Board keeping in view the government policy to make electricity available to certain key sectors of the states economy at affordable prices.

2. Methodology

- 2 1 The basic approach adopted in the review of current tariff structure has been to work out the basic average cost per unit of electricity sold to the consumers based on the technical and financial data furnished by GEB for the fiscal year 1994-95. The next step has been to work out the additional amount required for earning extra revenue which would enable GEB to (i) break even balancing its operating expenditure outgo against its revenue receipts and (ii) thereafter enable the Board to earn the statutory minimum surplus of 3%.
- 2.2 Having determined the relevant bridging amounts, attempt has been made to frame a rational pattern of consumer categorywise tariff structure with minimum possible impact on concerned sectors of consumers in respect of whom price escalation is inevitable.
- 2 3 For fixing the electricity tariff SEBs normally have been following the cost plus approach. However it is well recognized that this approach suffers from the serious drawback that the tariffs determined on this basis penalise the consumer for the inefficiency of the utility and there is no incentive in the tariff structure for the utility to improve its standard of technical as well as financial performance. Thus an ideal tariff structure should attempt to strike a balance between the interests of both the players in the field-viz the power utilities as well as the consumers. TERI's approach for this review has

therefore been based on the following two considerations :

- 2 3 1 To safeguard the financial viability of the utility by ensuring that the tariff is based on real costs of production whereby it can realise the expenditure incurred on fuel, O&M, Establishment, Power purchased from outside sources etc and is also able to make a minimum return of 3% as specified in the Indian Electricity Act. (Incidentally, the Ninth Finance Commission has recommended this minimum limit under the IE Act to be raised to 7%)
- 2 3 2 Safeguarding the interests of the consumer by ensuring that the avoidable financial losses incurred by the utility due to its inefficient technical performance, poor operation and maintenance practices, outdated management techniques etc are not passed on to the consumers.
- 2 4 In summary, TERI has attempted to work out a strategy for improving the financial viability of GEB by working out a tariff structure based on real costs of inputs and normative standards of performance
- 3 **Average tariff (1994-95) based on expenditure in 1994-95 as anticipated by GEB**
- 3 1 The average tariff calculations for 1994-95 are essentially based on the data furnished by GEB in their letters dated 7 5 95, 27 6 95 & 10 7 95, and the results are tabulated in Annexure - I. As far as possible, the data as furnished by the Board have been used in the calculations, except in respect of certain items where some logical assumptions had to be made because of obvious discrepancies etc Detailed discussions on each of the items considered in Annexure-I for working out the average tariff follows .
- 3 2 **T&D Losses**
- 3.2 1 According to data made available by GEB, the T&D losses anticipated by the Board during the year 1994-95 would be 19.5% (vide Item VI of GEB letter dated 22 6 95). Further total energy sold in the GEB system was 20044 MUs in 1993/94, and they anticipate a 10% rise in consumption in 1994/95 (vide item III of letter of 22 6 95) On this basis the anticipated energy sold in 1994/95 would be 22048 MUs and the calculations in Annexure-I are based on this figure

3.3 **Fuel**

- 3 3 1 As per Item X of GEB's letter dated 22.6.95, the anticipated expenditure likely to be incurred in 1994/95 on 'Fuel' would be of the order of Rs 1886 99 crores. Based on this figure and corresponding to 22048 MU expected to be sold during the year, the cost of 'Fuel' per unit of electricity sold works out to 85.59 paise/KWh.

3 4 **Interest**

- 3 4 1 In GEB's letter of 22 6 95 (Item-X), a figure of Rs 115 97 crores has been mentioned and it is stated that this covers the interest on government loan only. However the total loan component of an Electricity Board, apart from loan from Government sources also consists of loans from other sources viz financial institutions (e g LIC, PFC, REC, IDBI, NABARD etc). Since the details of loans from FIs for 1994/95 were not available, the overall interest burden of GEB for 1994/95 has been assessed on the basis of the corresponding figure of Rs 282 69 crores for 1992-93 as per actual annual accounts of the Board (vide Annual Statement of Accounts 1992/93) and making allowance for inflation at a compounded rate of @ 10% p a. On this basis the interest of GEB for 1994/95 works out to be of the order of Rs 342.05 crores, and the cost per unit sold works out to 15 51 p/KWh.

3 5 **Depreciation charges**

- 3 5 1 As per GEB's assessment the Depreciation charges for 1994/95 would be Rs 359.42 crores. It is presumed that this figure takes into account the enhanced depreciation rate of 7 5% which has since been allowed. The corresponding cost per unit of electricity sold during the year works out to 16 30 p/KWh.

3 6 **Operation & Maintenance charges**

- 3 6 1 O&M costs for 1993/94 according to GEB's letter dated 7 5.95 was 116 58 crores. GEB estimates, a corresponding figure of Rs 166 crores for 1995/96 (vide GEB letter dated 10 7 95). On this basis it has been estimated that the O&M charges would be of the order of Rs 141 crores, and that the O&M cost/unit of electricity sold would be 6.04 p/KWh for 1994/95.

3.7 Establishment charges

- 3.7.1 Corresponding to GEB's figures of Rs 273.68 crores and Rs 440 crores for the year 1993/94 and 1995/96 respectively, it has been estimated that for 1994/95. Establishment charges would be of the order of Rs 332 crores . This works out to 15.06 p/unit of electricity sold.

3.8 Interest on working capital

- 3.8.1 For this item GEB has furnished a figure of Rs 317.75 crores for 1994/95. Considering that as per IE Act working capital should be about one sixth of expenditure on Fuel, O&M & Establishment, it appears that the figure of Rs 317.75 crores is actually the 'working capital' and not the interest on working capital. (It is seen from Annexure-I, that on this basis, the working capital works out to one sixth of Rs 2360 crores - i.e. Rs 393.3 crores) In TERI calculations therefore the interest on working capital has been taken as 18% of Rs 317.15 crores i.e. Rs 57.20 crores. Thus the cost of interest on working capital per unit of electricity sold would work out to 2.59 p/KWh.

3.9 Power Purchased

- 3.9.1 This item covers the estimated payments to be made by GEB to agencies like National Thermal Power Corporation (NTPC) and Nuclear Power Corporation (NPC) for drawing Gujarat's share of power in Central sector power stations like Korba & Vindhyachal of NTPC and Tarapur Nuclear Station of NPC. On the basis of the estimated expenditure of Rs 562.02 crores, the cost per unit of power purchased works out to 25.49 p/KWh of electricity sold.

3.10 3% Return on Net Assets in use less consumer's contribution

- 3.10.1 According to Indian Electricity Supply Act, an Electricity Board is required to earn an annual return of at least 3% on its net assets in use (less consumer's contribution) for the 'Net Assets'. In 95/96 GEB has furnished a figure of Rs 3504 crores and the return @ 3% on this amount works out to Rs 105.12 crores. Considering that in 1994/95 about 22048 MU are expected to be sold, the cost of this item works out to 4.77 p/KWh.
- 3.11 Summing up, for the fiscal year 1994/95, based by and large on data as furnished by GEB, the total estimated operating expenditure would be around Rs 3680.68 crores corresponding to 22048 MU of electricity anticipated by GEB to be sold during the year, the average cost of electricity works out to

about Rs 1.67 /KWh For earning a return of 3% on net assets of GEB in use less consumers contribution, the average tariff would be around Rs 1.72 KWh of electricity sold to the consumers during 1994/95

4 Tariff based on estimated operating expenditure in 1994/95 based on normative parameters of performance

4.1 As discussed earlier TERI's approach for fixing tariff for GEB would be such that while it would ensure that the income of the Board from sale of power atleast balances the operational expenditure incurred by them towards generation of power, bulk purchase of power from outside sources as well as the operation and maintenance and establishment charges. At the same time the interests of the consumer would be kept in view by taking into account in the tariff calculations the possible improvements in operational efficiency that could be reasonably achieved by the utility which would result in reduction of its operational costs

4.2 The results of the tariff fixation study based on real costs of inputs for power generation and normative standards of performance are given in Annexure II. Brief discussions on each of the relevant items which have a bearing on tariff calculations are discussed below :

4.2.1 T&D Losses

According to the information furnished by GEB the T&D loss for the year 1992/93 was 21.13% which is estimated to have been brought down to the level of 20% (comprising 7.66% transmission & 12.34% distribution losses) in 1993/94. GEB has stated they expect that by 1994/95 they would be able to bring down the losses to about 19.5%. Although the break down of this overall figure of T&D losses of 19.5% have not been given, based on the break down figure for 1992/93, prorata the figure of 19.5% losses for 1994/95 would be:

Trans Losses : 7.5%
Distribution : 12.0%
Losses

Total **19.5%**

4.2.1.1 As far as the transmission losses are concerned, average figure for these losses for the country as a whole would be around 4.5%. Even conceding that the transmission system of GEB comprises of comparatively longer lines compared

to some of the other states, transmission losses of 7.5% are excessive. This indicates lack of adequate transmission facilities probably due to inadequate investments in transmission sector. This distortion needs to be corrected without loss of time, and adequate funds should be made available for completion of the ongoing transmission projects in the state. In the meantime, adoption of steps for providing required reactive support to the system by installation of Static Var Systems (SVR), adoption of series compensation for the lines for the purpose of optimum loading of the transmission lines should be considered. The target for 1994/95 should be to reduce the transmission losses from 7.66% in 1993/94 to the level of at least 6.66% - i.e. a reduction of 1% over the year.

4.2.1.2 In so far the distribution losses are concerned, the figure of 12.34% in 1993/94 and 12% in 1994/95 is too much on the high side, and it should be possible to reduce this. The achievable limits for distribution losses may be considered to be as 11% if not lower. Measures like power factor improvement by installation of capacitors, reduction of L.T./H.T. line length ratio, reduction of overloading on lines & transformers etc would be needed for this purpose. Thus reduction of distribution losses from the level of 12.34% in 1993/94 by 1% over the period of one year (1993/94 - 1994/95) may be considered to be a reasonable target that could be achieved by GEB.

4.2.1.3 In view of the above, for the tariff calculations the normative figure of 18% for T&D losses (Trans losses 6.66% & Distribution losses 11.34%) has been assumed. Corresponding to this level of losses the number of units available for sale increases to 22459 MUs (as against 22048 MU corresponding to 19.5%).

4.2.2 **Fuel**

From the data furnished by GEB it appears that the estimated expenditure of Rs 1886.99 crores towards fuel in 1994/95 is based on actual coal consumption varying from 0.58 to 0.75 kg/kwh (inclusive of transit losses). Average heat rate of GEB power stations works out to 2850 kcal/kwh. However assuming a normative overall station efficiency of 32.5%, station heat rate works out to 2650 kcal/kwh - corresponding to which coal consumption works out to 0.63 kg/kwh for coal with a calorific value of 4200 kilo calories. Assuming a normative heat rate value of 2650 kcal/kwh as against the GEB figure of 2850 kcal/kwh, the expenditure of Rs 1886.99 crores towards fuel in 1994/95 estimated by GEB could be reduced by the factor $2650/2850 = 0.93$. Thus fuel expenditure on normative basis would be around $0.93 \times 1886.99 = \text{Rs } 1754.95$ crores.

4.2 3 **Interest, Depreciation, Interest on working capital, Power purchased and Return on net assets in use.**

4 2 3 1 The same comments as in para 4 are applicable in respect of each of the above items except that the calculations for cost per unit sold for the individual items are based on normative figure of 18% for T&D losses corresponding to which number of units of electricity sold works out to 22459 MU (as against 22048 MU for T&D losses @ 19.5% estimated by GEB).

4 2 4 **O&M and Establishment charges**

It will be seen from Annexure-I that on the basis of GEB data, the estimated cost for O&M and Establishment charges taken together works out to about 21.5 P/unit of electricity sold.

4 2 4 1 For working out normative figures for these charges it would be better to work out the requirement of O&M and Establishment charges for the associated generation, Transmission and Distribution components separately as the norms for each of these components would be different. For thermal power stations as well as Transmission & Distribution the usual practice is to adopt a figure of about 2.0% for O&M and Establishment. 1% each both for O&M and Establishment charges is considered reasonable. Keeping in view the magnitude of capital costs involved and the likely quantum of labour-intensive activities involved, corresponding figures for Transmission, subtransmission and distribution that may be considered reasonable are :

Transmission

O&M	0.75% }	
Establishment	0.75% }	1.5% of capital cost of transmission

Subtransmission .

O&M.	1.0% }	
Establishment	0.75% }	1.75% of capital cost of subtrans.

Distribution

O&M	1.0% }	
Establishment	2.0% }	3% of capital cost of Distribution.

4.2.4.2 Normative figures for these items have been worked out from above considerations - and are given at Annexure-III. It will be seen that the normative figures for O&M work out to 12.20 p/unit -Annexure-II (as against 6.40/unit estimated by GEB- Annexure-I). For 'Establishment' charges normative figure works out to 13.67 p/unit -(Annexure-II) (compared to 15.06 p/unit as per GEB estimate) - Annexure-I. Thus for higher operational efficiency GEB should enhance its expenditure on O&M by about 5.8 p/unit, and reduce its Establishment charges by about 1.4 p/unit.

4.2.4.3 Summing up, it is seen that the average cost per unit sold based on normative figures of performance suggested by TERI are as below

Average cost per unit sold for just recovering the annual operational Expenditure - Annexure - II	Rs 1.63/KWh
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Average cost per unit sold for earning a return of 3% - Annexure - II	Rs 1.68/KWh
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5. **Assessment of tariff enhancement necessary for ensuring financial viability of GEB**

5.1 According to the data furnished by GEB (vide Item 14 of letter dated 7.5.95) average cost of energy sold by the Board in 1993-94 was Rs 1.53/KWh. As against this, it will be seen from Annexure-I, that based on the data made available to TERI by GEB in regard to their estimates of annual operating expenditure in 1994/95, the cost/KWh sold works out to around Rs 1.67/KWh. This means that GEB is currently losing at the rate of 14p/unit of electricity sold to its consumers.

The above figure of Rs 1.67/KWh however contains a component of avoidable expenditure which could be attributed to reasons of higher T&D losses of 19.5% in GEB system which would result in lesser quantum of electricity available for sale to its consumers causing avoidable loss of revenue to the Board. Further, as already discussed it is felt that there is scope for effecting some savings in expenditure on fuel for power generation. Making allowance for these possible improvements that could be achieved by GEB, the cost/KWh of electricity sold on no profit no loss basis works out to Rs 1.63/KWh (vide Annexure-II) i.e. 4p/unit less than the rate based on GEB estimates of operational expenditure in 1994/95. In view of the reasons discussed earlier it would be appropriate to pass on this benefit of possible better performance of the Board to the consumer.

5.2 With the above suggested hike of 10 p/unit over GEBs current rate of Rs 1 53/KWh, it would be possible for the Board to recover fully the operational expenditure incurred by it provided it is able to achieve the normative standards of performance discussed earlier.

However, according to the stipulation of the I E. Act, the SEBs are expected to earn a return of 3% over their net assets. For enabling the Board to fulfil this requirement, it will be necessary to revise the tariff by another 5p/KWh vide Annexure-II

5.3 To sum up, the tariff situation emerges as below

		Based on expenditure as estimated by GEB for 1994-95	Based on expenditure as per normative performance parameters
1	Suggested average tariff (1994/95) for no-loss no-profit	Rs 1 67 / kwh	Rs 1 63 / kwh
2	Suggested average tariff (1994/95) for making 3% statutory return	Rs 1.72 / kwh	Rs. 1 68 / kwh

6 Recommendations regarding Consumer categorywise

Tariff Structure

6.1 Having determined the average tariffs mentioned in para 5.3 above, attempt has been made to frame the tariff for different categories of consumers, keeping in view the need to keep the rates for the Agriculture and Domestic sectors at comparatively lower levels in accordance with the Government's policy of making power available to these sectors at affordable prices. The losses incurred by the utility on this account have been compensated by keeping somewhat higher tariffs for other consumer categories like industrial, commercial etc. In other words, the rationale already being followed by GEB in this regard has been adopted for fixing the tariff for different sections of the consumers

- 6 2 The consumer categorywise tariff for 1993-94 calculated on the basis of the data furnished by GEB is summarised in Annexure-V. It is seen therefrom that as against the overall average tariff of 153p/kwh, the rate of electricity for agricultural/irrigation is the lowest being 24p/kwh, and the highest rate is for the commercial sector (330-40p/KWh) followed by the Industrial Sector (L V 298.48 p/kwh & H.V 267.80p/kwh. This means that the agricultural supply is being heavily subsidized by these two sectors. The domestic tariff is also being heavily subsidized by these two sectors. In suggesting the modified structure of consumer categorywise tariff, these two facts have been kept in mind. As regards the tariff for Agriculture, although the current rates are resulting in heavy losses to the utilities, yet in accordance with the decision taken at the last meeting of the National Development Council (NDC), the extent of proposed increase in this sector has been limited to 50 p/unit only. The losses resulting from this heavily subsidized tariff has been suitably compensated by increase in the tariffs mainly in the Industrial and Commercial sectors. Increase in the domestic sector also has been purposely kept at a rather lower level.
- 6 3 Consumer categorywise tariff structure worked out for no-profit no-loss basis, is given in Annexure-VI. This table indicates the proposed tariff structure for two possible options . (i) based on T&D loss norms and fuel consumption norms as anticipated by GEB for 1994/95 and (ii) based on the respective norms suggested by TERI. Similar exercise for the two options of performance for enabling the GEB to achieve the statutory return of 3% is given in Annexure VII.
- 6 4 In summary, the recommendations in regard to the modified tariff structure both according to the anticipated operational performance by GEB in 1994-95 and that suggested by TERI are indicated below.

(i)

For No-Profit No-Loss

Sl No	Category	Average Tariff as per GEB operational Norms (p/KWh)	Average Tariff as per operational Norms suggested by TERI (p/KWh)
1	Domestic	140 00 (+10)	135 00 (+5)
2	Commercial . .	340 40 (+10)	340 40. ..(+10)
3	Industrial (LV)	300 48 (+5)	298 48 .(0)
4	Industrial (HV)	270 30 (+3) . .	267 80. (0)
5	Public Lighting .	171 00 (0)	171 00. . .(0)
6	Rly Traction ..	275 81 (0)	275 81 . . (0)
7	Agriculture	50 00 (+26) .	45 00 . (+21)
8	Licensees	260 39 (+11) . .	249 39 . (0)
Overall Average Tariff		167 09 (+14)	162 83 .. (+10)

Note

Figures in bracket indicate the suggested increase in tariff w r t the categorywise average tariff corresponding to overall average tariff of 153 p/KW (1993/94) - Annexure V

With the tariff structure suggested in the last column of the table, there will be a marginal surplus of Rs 32 crores - (Annexure - VI — Annexure - II)

(ii)

For 3% Statutory Return

Sl. No.		AV Tariff as per GEB operational Norms (P/KWh)	AV Tariff as per TERI operational norms (P/KWh)
1.	Domestic.. . .	151 00 (+ 21)	140 00 (+ 10)
2.	Commercial. ...	350 40 (+ 20)	340 40 (+ 10)
3.	Industrial (LV) .	305 48 (+ 7) . .	300 48 (+ 2) .
4.	Industrial (HV) .	279 80 (+ 12)	271 80 (+ 4)
5.	Public Lighting ..	175 00 (+ 4).	171 00 (0)
6.	Rly Traction. .	275 81 (0) .	275 81 (0)
7.	Agriculture	50 00 (+ 26)	50 00 (+ 26)
8.	Licensees .	264 39 (+ 15)	259 39 (+ 10)
Overall Average Tariff		171 65 (+ 19)	167 43 (+ 14)

Note

Figures in bracket indicate the suggested increase in tariff w r t categorywise average tariff corresponding to overall average tariff of 153 p/KWh (1993/94) - Annexure - V

6.5

Average Cost Per Unit Sold

The average cost per unit sold as worked out in Annexure-II, for various items i.e, Interest, Depreciation, O&M, Establishment etc has been further sub divided under generation, transmission & distribution heads and is tabulated in Annexure - VIII (a). The bifurcation of average cost per unit sold has been carried out in the ratio of Net assets of generation, transmission and distribution furnished by GEB vide item 19 of their letter dated 7.5.95 in respect of Sl no 2,3 and 6. In the case of Sl No 4 and 5, the figures have been taken from Annexure-III

6.6

Average Cost per unit sold at various voltages

The methodology of working out the average cost per unit sold at various voltages has been tabulated and given in Annexure VIII (b) which is self explanatory

6 7 **Energy sold and T&D losses**

Based on the GEB data for energy sold at various voltages (item II of letter dated 22 6 1995), the voltages wise energy transmitted, lost and sold has been worked out and is tabulated in Annexure-IX. The transmission and distribution losses at various voltages has been assumed with a view to limit the overall T&D losses in the system at 18% The percentage of T&D losses assumed in various elements at various voltages has also been indicated in the Annexure - IX.

6 7 1 Annexure - X gives the energy sold voltage wise and T&D losses in the system in the form of a single line diagram to make it more comprehensive

6 8 **Category wise average tariff and average cost (1994-95)**

A comparative statement indicating consumer category wise as well as voltage wise average tariff suggested by TERI and the average cost/unit sold as worked out in previous Annexures is given in Annexure - XI The present average tariff as per data furnished by GEB has also been indicated in this Annexure An analysis of this table indicate that although the overall average cost per unit sold and average tariff suggested by TERI to earn 3% return are same, there is wide variation in the categorywise average cost worked out on supply voltage basis [Annexure - VIII (b)] and average tariff suggested by TERI

6.9 **Rationalized Tariff Pattern**

In order to rationalize the average tariff structure; the average tariff for domestic and public lightening categories has been kept equal to the average cost per unit sold and a uniform increase of 65% in the tariff has been suggested in the average cost per unit in the case of commercial, Industrial, railway traction and licenses categories. However in the case of Irrigation/Agriculture consumers, a subsidy of 50 percent in the average cost per units has been suggested These overall changes in Tariff pattern would enable GEB to earn a statutory 3% return The categorywise and voltage wise average tariff pattern suggested is given at Annexure - XII.

7 0 **Slabwise tariff pattern for domestic and commercial consumers**

The rationalized tariff pattern as suggested by TERI in Annexure XII, has been further modified for domestic and commercial consumers to work out the slabwise tariff. The basis of working out the slabwise tariff is the data of

categorywise consumption furnished by GEB. Annexure - XIII indicates the slabwise tariff suggested by TERI in respect of domestic and commercial consumers.

7 1

Subsidies

As per the present Average Tariff, GEB is giving a subsidy of about 84% and 15% in Agriculture and Domestic Average Tariff respectively where as the subsidy in Average Tariff for Agriculture and Domestic Tariff is proposed to be reduced to 50% and nil respectively in the rationalized tariff suggested by TERI.

8 0

CONCLUSIONS

From the preceeding paragraphs, it can be concluded that the following basic data would be the minimum requirement to review the tariff of the Board/Area

- (i) Anticipated Annual Expenditure during the said year towards
 - (a) Interest as well as interest on working capital
 - (b) Depreciation
 - (c) Power purchased
 - (d) Fuel
- (ii)
 - (a) Average heat rate of thermal stations under Board/Area
 - (b) Rate of coal or Average coal consumption (inclusive of transit losses) along with calorific value of coal
- (iii) Anticipated Transmission and Distribution losses separately
- (iv) Anticipated Annual Energy Consumption- Statewise, categorywise and voltage wise
- (v) Existing tariff structure

Annexure-I

Average Tariff based on Estimated Annual operating Expenditure in 1994-95 based on data furnished by GEB

Sl. No	Item	Estimated expenditure (Rs crores)	Cost/unit sold (p/unit)
1	Fuel	1886.99	85 59
2	Interest	342.05	15 51
3	Depreciation	359 42	16 30
4	O & M	141 00	6 40
5	Establishment	332.00	15.06
6	Surplus & Reserve	-	-
7	Interest on working capital	57.20	2 59
8	Power purchased	562.02	25 49
9	TOTAL-I	3680 68	166 94
10	Net assets in use less consumers contribution	3504	
11	3% return on above (S No 10)	105.12	4 77
12	TOTAL-II (9+11)	3785 80	171 71

Notes:

- i) Calculation based on T&D losses of 19.5% (vide item VI GEB letter 22.6.1995) which works out to 22048 MU of energy sold as per Item III GEB letter dated 22.6.95
- ii) Estimated expenditure figures towards Fuel, Depreciation, O&M and Establishment charges, Power purchased and Net assets less consumers contribution are based on data furnished by GEB in their letters dated 7.5.95, 22.6.95 & 10.7.95
- iii) Since the data regarding 'Interest' furnished by GEB covers only the interest on Govt. Loans, the total loan component has been worked out on the basis of actual interest charges for 1992/93 (vide - Annual Statement of Accounts. 1992/93)
- iv) Interest on working capital has been worked out @18% pa interest rate on working capital of Rs 317.75 (vide GEB letter dated 22.6.1995)
- v) For detailed notes on each of the above items, please see para 4 of the report

Annexure II

Average tariff based on operating expenditure as per normative parameters for the year 1994-95

Sl. No.	Item	Estimated Expenditure * (Rs crores)	Cost/unit sold (p/unit)
1	Fuel	1754 95	78 14
2	Interest	342 05	15 23
3	Depreciation	359 42	16 00
4	O & M	274 00	12 20
5	Establishment	307 01	13 67
6.	Surplus & Reserve	-	-
7	Interest on working capital	57 20	2 55
8	Power purchased	562 02	25 02
9.	TOTAL -I	3656 65	162 81
10	Net asset in use less consumers contribution	3504	
11	3% return on above (S No 10)	105 12	4 68
12	TOTAL-II	3761 77	167 49

Notes :

- (i) The calculations are based on T&D Loss of 18% (Normative), which works out to 22459 MU of energy sold during 1994/95
- (ii) Fuel cost worked out on basis of normative station heat rate value of 2650 kcal/kWh (value achieved by Ukai in 1990/91) & 5 ml/kWh for oil.
- (iii) Expenditure towards interest assessed on basis of actual amounts incurred in 1992-93 (vide Annual Statement of Accounts 1992-93) and making allowance of 10% per year to cover inflations
- (iv) Expenses towards O&M and establishment based on normative figures of 12 20 p/unit sold & 13 67 p/unit sold respectively vide Annexure III
- (v) Interest on working capital based on 18% interest on working capital of Rs 317 75 crores
- (vi) Expenditure on Power Purchased and 'Depreciation' based on GEBs assessment for 1994-95 (vide GEB coal letter dated 22 6 95)
- (vii) For detailed discussions in regard to the normative values assumed in respect of each of the above items, please see note

Annexure III

Calculation of normative cost/unit for O & M and establishment charges

S No	Item	Generation	Transmission and distribution				TOTAL GEN. + T & D
			Trns.	Sub-trans	Distribution	Total	
1	A CAPITAL COST/KW (RS)	32,000	10,650	4,250	6,400	21,300	53,300
2	B NORMS AS PERCENTAGE OF 'A'						
	(i) O&M	1 0	.75	1 0	1.0	-0 87	0 95
	(ii) ESTB	1 0	.75	.75	2 0	-1 13	1 05
3	C EXP /RW (RS)						
	(i) O&M	320 00	80 00	42	64	186	506
	(ii) ESTB	320 00	80 00	32	128	240	560
4	EXP /Unit sold						
	(i) O&M	7 7	1 94	1 0	1 56	4 5	12 20
	(ii) ESTB	7 8	1 95	0 8	3 12	5 87	13 67
	Total	15.5	3.89	1.8	4.68	10.37	25.87

Notes :

1 Units sold/year
(for T&D losses
@ 18%)'

- No of hours/Yr x (PLF) - 9% Aux consumption
-18% T&D Losses

- 8760 63 - 09 (No of hrs x PLF) - 18 x (A-B)

A B

- {5519 - 09 x 5519} - 18 (5519 - 09 x 5519)

- 5519 - 497 - 18 (5022)

- 5519 - 497 - 904

- 4118 units

2 The capital expenditure per KW on Generation and Transmission has been assumed in ratio of 60:40

3 The break up of capital expenditure per KW between Transmission, Sub Transmission & Distribution has been assumed as 50%, 20% and 30% of total capital expenditure per KW on Transmission and Distribution

Annexure IV

Assessment of increase in tariff required for wiping off the losses incurred by GEB due to existing tariff structure & increase required for earning 3% return

Sl. No.	Description	Tariff based on annual operating cost ((94-95)		Source
		Based on GEB data	Proposed by TERI based on normative parameters	
1	Estimated average cost of electricity (Rs /Kwh)	1 67@	1 63@@	@Annexure-I @@Annexure-II
2	Loss incurred by GEB/unit (Rs /Kwh)	0 14	0 10	
3	Annual loss incurred by GEB in (94/95) by sale of electricity (Rs. Crores)	313 71 *	224 59 **	Units of electricity SOLD * 22408 MU ** 22459 MU
4	Increase required in present average tariff of Rs 1 53/unit to nullify the losses at S No 3 of above	0 14	0 10	
5	Increase required in present average tariff of Rs 1 53/unit to earn 3% statutory return on "Net assets in use less consumers contribution"	0 14 + 05 * Rs 0 19/ Kwh	0 10 + 05 ** = Rs 0 15/Kwh	* Annexure-I, Item II ** Annexure-II, Item II

Note The above assessment of tariff hike required is with respect to the basic average tariff of Rs 1 53 per kWh as per data furnished by GEB for 1993/94 in their letter dated 7 5 95 - Item 14

Annexure - V

Consumer categorywise tariff for 1993-94 as per data furnished by GEB

Sl No.	Consumer category	Elecy. consumption MU	% Revenue	Revenue Rs crores	Average Tariff P/KWh
1	Domestic	1777	7 53	230 92	130 00
2	Commercial	504	5 43	166 52	330 40
3	Industrial LV	1834	17 85	547 41	298 48
4	Industrial HV	5388	47 05	1442 89	267 80
5	Public lighting	88	0 49	15 03	171 0
6	Rlys Traction	318	2 86	87 71	275 81
7	Irrigation	8652	6 73	206 39	24 00
8	Licensees etc	1483	12 06	369 85	249 39
9	Overall Average for all sectors	20044	100%	3066 73	153.00

Annexure - VI

Consumer categorywise Tariff proposed for power supply on no-profit no-loss basis (1994-95)

Sl. No.	Consumers category	Based on GEB data			Based on normative parameters		
		Electricity sold MU	Average Tariff P/KWh	Anticipated Revenue (Rs crores)	Electricity sold MU	Average Tariff P/KWh	Anticipated Revenue (Rs crores)
1	Domestic	1955	140	273 70	1991	130	258 83
2	Commercial	554	340 40	188 58	565	330 40	186 45
3	Industrial LT	2017	300 48	606 07	2055	298 48	613 38
4	Industrial HV	5927	270 30	1602 06	6037	267 80	1616 71
5	Public lighting	97	171	16 59	99	171	16 93
6	Rly Traction	350	275 81	96 53	356	275 81	98 19
7	Agriculture	9517	50	475 85	9694	50	484 70
8	Licencees etc	1631	260 39	424 70	1662	249 39	414 49
	Total	22048	167.09	3684 08	22459	164 28	3689 68

Annexure - VII

Consumer categorywise Tariff proposed for Earning 3% Statutory Return (1994-95)

Sl No.	Consumers category	Based on GEB data			Based on normative parameters		
		Electri-city sold MU	Average Tariff P/KWh	Anticipated Revenue Rs crores	Electri-city sold MU	Average Tariff P/KWh	Anticipated Revenue Rs crores
1	Domestic	1955	151	295 21	1991	140 00	278 74
2	Commercial	554	350 40	194 12	565	340 00	192 37
3	Industrial LT	2017	305 48	616 15	2055	300 48	617 49
4	Industrial HV	5927	279 80	1658 37	6037	271 80	1640 86
5	Public lighting	97	175	16 97	99	171 00	16 93
6	Rly Traction	350	275 81	96 53	356	275 81	98 19
7	Agriculture	9517	50	475 85	9694	50	484 70
8	Licencees etc	1631	264 39	431 22	1662	259.39	431 06
	Total	22048	171.65	3784.42	22459	167.43	3760.34

Annexure - VIII (a)

Calculation of average cost for Gujarat Electricity Board 1994-95 with 3% Return

Sl. No.	Item	Generation	Trans.	Sub-Trans	Distribution	Total T&D	Average G & T&D
1	Fuel cost (paise/unit)	78 14	-	-	-	-	78 14P
2	Interest p/kwh	7 08	3.65	1 00	3 5	8 15	15 23
3	Depreciation	8 26	4 25	1 00	2 49	7 74	16 00
4	O&M	7 70	1 94	1 00	1 56	4 50	12 20
5	Establishment	7 80	1 95	0 80	3 12	5 87	13 67
6	Int on W C.	1 25	0 53	0 20	0 57	1 30	2 55
7	Exp on power purchase	-	3 02	4 00	18 00	25 02	25 02
	Total	110.23	15.34	8.00	29.24	52 58	163 00

The overall average tariff for earning 3% return works out to paise 168 00 as per Annexure VII of draft report

Notes:

- 1 The total expenditure on central/other power received at grid stations by GEB divided by total number of units available for sale i.e. 22459 MU during the year to arrive at the component of cost/unit for arriving at average tariff
- 2 The total annual expenditure towards purchase of power has been allocated towards trans, sub-trans and distribution in proportion to the units sold at various buses
- 3 Items at Sl No 4 & 5 are as per Annexure - III

Annexure - VIII (b)

Tariff suggested by TERI based on normative parameters for earning 3% statutory return

1	Average cost at Gen busbar with 3% statutory return	- -	110 23 ^{xx} paise + 4 68 ^x 114 91 Say - 115 paise
2	Average cost suggested at EHT Bus i e 220 kv, 132 kv & 66 kv	- -	114.91 + 15.34 [@] 130 25 Say 130 paise
3	Average cost suggested at HT Bus (33/22/11kv)	- -	130 25 + 8.00 ^{@@} 138 25 p Say 138 paise
4	Average cost suggested at L T Bus (400/220 Volts)	- -	138 + 29 24 ^{xxx} 168 paise

x Item 11, Annexure II

xx Column 2, Annexure VIII (a)

@ Column 3, Annexure VIII (a)

@@ Column 4, Annexure VIII (a)

xxx Column 5, Annexure VIII (a)

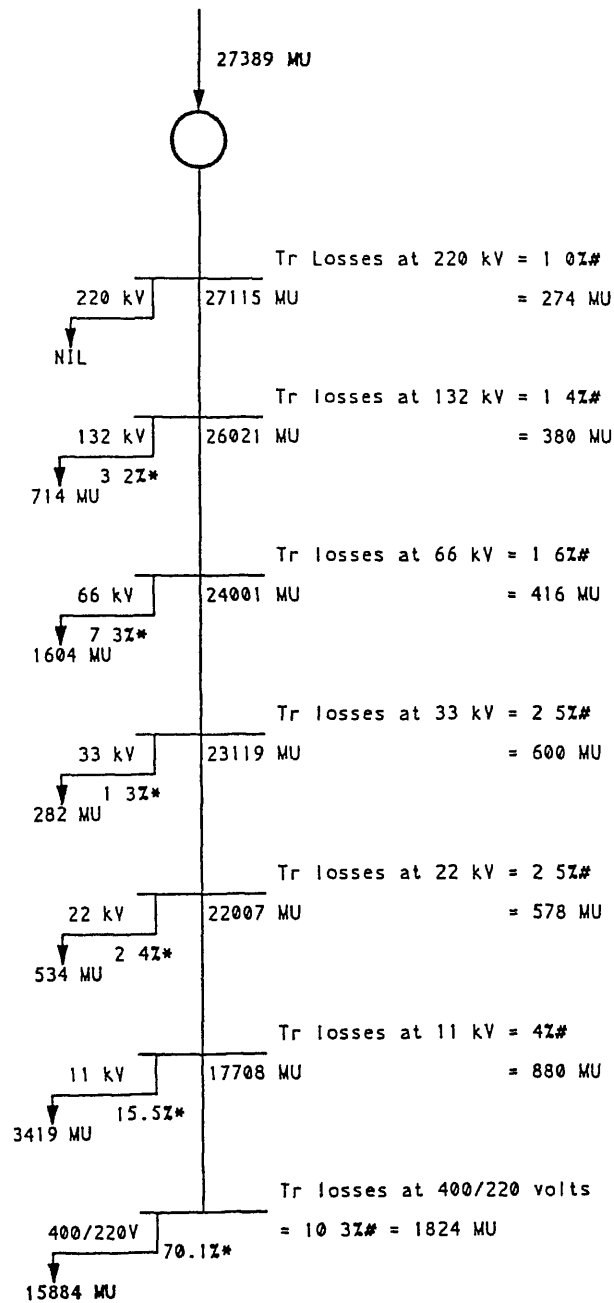
Annexure - IX

Energy sold and Transmission & Distribution losses at various voltages

Sl. No.	Voltage Level KV	Percentage losses in		Total	Energy (MU)		
		Transformer	Transmission lines		Transmitted	Lost	Sold
1	220	0.15	0 85	1 00	27389	274	-
2	132	0.20	1 20	1 40	27115	380	714
3	66	0.20	1 40	1 60	26021	416	1604
4	33	0 50	2 00	2 50	24001	600	282
5	22	0.50	2 00	2 50	23119	578	534
6	11	0.80	3 20	4 00	22007	880	3419
7	4/ 22	1 3	9 00	10 3	17708	1824	15884
	Total				Total	4952	22437

Annexure - X

VOLTAGEWISE CONSUMPTION AND T&D LOSSES



* = Per cent of the total units sold i.e. 22459 MU as per data furnished by GEB

= Assumed

NOTE = T&D losses assumed as 18%, therefore units available at generator bus = $22459 / 0.82 = 27389$ MU

Annexure - XI

Table showing consumer categorywise average tariffs versus average costs per unit on considerations of sale at EHT, HT & LT supply

Sl. No.	Category of Consumer	Average Tariff as per GEB data (1993-94)	Average Tariff suggested for 1994-95 for earning 3% return	Average costs on supply voltage basis 1994-95 Annex-VIII(b)
1	Domestic	130	14 0	168 00
2	Commercial	330 40	340 40	168 00
3	Industrial L.T	298 48	300 48	168 00
4	Industrial HT 11 kv } 22 kv } 33 kv } 66 kv } 132 kv }	267 80	271 80	138 00 130 00
5	Public lighting	171	171 00	168 00
6	Rly Traction	275 81	275 81	138 00
7	Irrigation	24 00	50	168 00
8	Licenses	249 39	259 39	168 00
	Overall Average/unit (paise)	153 00	168 00	168 00

Annexure - XII

Suggested rationalised tariff pattern for earning 3% statutory return during 1994-95

Sl. No.	Consumer Category	Units sold during 1994-95 Million KWh (MU)	Present Average Tariff based on GEB data p/KWh	Voltage wise Average cost based on 3% return with normative parameters p/KWh	Suggested % increase in Avg. tariff based on normative and 3% return	Suggested Avg. tariff pattern w.r.t col. 5 p/KWh	Anticipated Revenue during 1994-95 (Rs crores)	
							Based on increased tariff (Col 7)	Based on present tariff (Col. 4)
1	2	3	4	5	6	7	8	9
1	Domestic	1991	130	168	0	168	334 49	258 83
2.	Commercial	565	330 40	168	65	277	156 50	186 68
3	Industrial L T.	2055	298 48	168	65	277	569 24	613 38
4	Industrial H T	3902		138	65	228	889 66	
	Industrial E.H.T.		267 80					1621 53
		2135		130	65	215	459 03	
5.	Public lighting	99	171	168	0	168	16 63	16 93
6.	Rly Taction	356	275 81	138	65	228	81 17	98 19
7.	Irrigation	9694	24	168	(-)50	84	814 30	232 66
8.	Licences	1662	249 39	168	65	277	460 37	414.49
	Total	22459	153.29	158.70		168.37	3781.39	3442.69

Note. Columns 3 and 4 are based on data furnished by GEB

Annexure - XIII

Suggested slabwise tariff pattern for domestic and commercial consumers during 1994-95

Sl. No.	Consumer Category slab	Percentage consumption of total domestic consumption	Units sold slabwise MU	Suggested tariff to earn 3% return paise	Anticipated annual revenue Rs crores
1	2	3	4	5	6
1	A Domestic				
2	1-50 units/month	18	358	75	26 85
3	51-100 -do-	26	518	120	62.16
4	101-200 -do-	26	518	185	95 83
5	Above 200 - do-	30	597	250	149 25
6	Sub total	100	1991	167 80	334 09
7	B Commercial				
8	1-50 units/month	5	28	150	4 20
9	51-150 -do-	12	68	200	13 60
10	Above 150 -do-	83	469	295	138 36
11	Sub total	100	565	276 40	156 16

